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National Eutrophication Survey, Corvallis, Oreg

Prepared for

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NATIONAL EUTROPHICATION SURVEY

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REPORT

ON

LAKE BISTINEAU

BIENVILLE, BOSSIER AND WEBSTER PARISHES

LOUISIANA

EPA REGION VI

WORKING PAPER No. 529

WITH THE COOPERATION OF THE

LOUISIANA WILD LIFE AND FISHERIES COMMISSION

AND THE

LOUISIANA NATIONAL GUARD

MARCH, 1977

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT ON LAKE BISTINEAU

BIENVILLE, BOSSIER AND WEBSTER PARISHES, LOUISIANA

EPA REGION VI

by

National Eutrophication Survey

Water and Land Monitoring Branch
Monitoring Applications Laboratory
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Eutrophication Survey Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

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OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

March 1977

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the states.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control for professional involvement, to the Louisiana National Guard for conducting the tributary sampling phase of the Survey, and to those Louisiana wastewater treatment plant operators who provided effluent samples and flow data.

Robert A. Lafleur, Chief; J. Dale Givens, Assistant Chief; Lewis R. Still, Biologist; Louis Johnson, Biologist; Lee Caubarreaux, Biologist; Darrell Reed, Engineer; Dempsey Alford, Biologist; and Elwood Goodwin, Water Quality Control Technician, all of the Louisiana Wild Life and Fisheries Commission, Division of Water Pollution Control reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

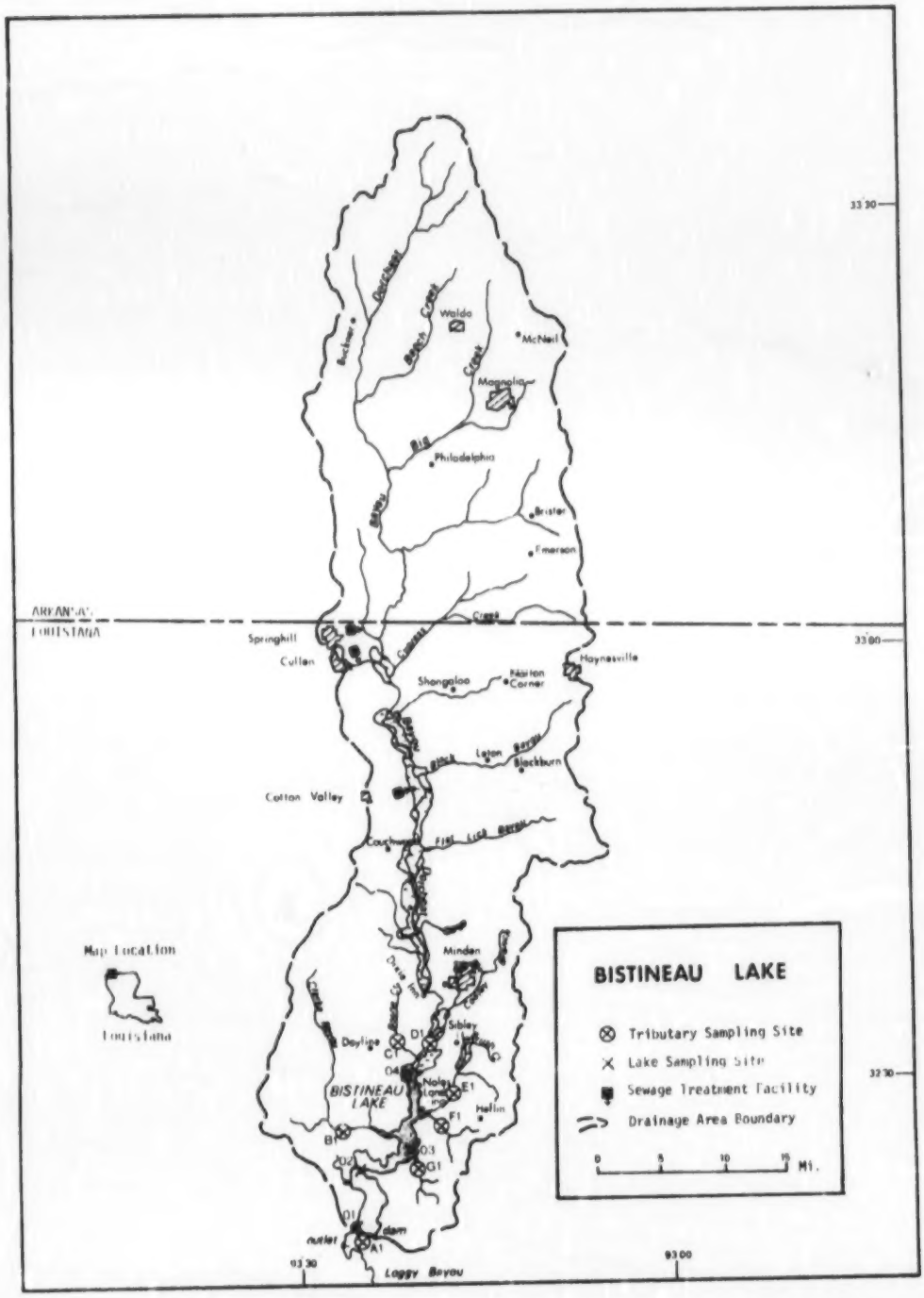
Major General O'Neil Daigle, Jr., the Adjutant General of Louisiana, and Project Officer Colonel Lawrence P. Dupre, who directed the volunteer efforts of the Louisiana National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF LOUISIANA

LAKE NAME	PARISH
Anacoco Lake	Vernon
Lake Bistineau	Bienville, Webster
Black Bayou	Caddo
Black Lake	Natchitoches and Red River
Bruin Lake	Tensas
Bundicks Lake	Beauregard
Caddo Lake	Caddo (Menon and Harrison in Texas)
Cocodrie Lake	Concordia
Cocodrie Lake (Lower)	Rapides
Concordia Lake	Concordia
Cotile Lake	Rapides
Cross Lake	Caddo
D'Arbonne Lake	Union
False River Lake	Pointe Coupee
Indian Creek Reservoir	Rapides
Saline Lake	LaSalle
Turkey Creek Lake	Franklin
Lake Vernon	Vernon
Lake Verret	Assumption


BISTINEAU LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
0 5 10 15 Mi.
Map Location
Louisiana
ARKANSAS
LOUISIANA
Springhill
Cullen
Shongaloo
Minden
Doyline
Sibley
Nolan Lake
Hollin
Cotton Valley
Haynesville
Blackburn
Bristor
Emerson
Philadelphia
Waldo
McNeil
Magnolia
Bodcaw Creek
Big Creek
Cypress Creek
Loggy Bayou
outlet
dam
33 30
33 00
32 30
93 30
93 00

REPORT ON LAKE BISTINEAU, LOUISIANA

STORET NO. 2203

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Lake Bistineau is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of each lake. Of the 19 Louisiana lakes sampled in 1974, 9 had higher median total phosphorus or inorganic nitrogen levels, and 6 had higher median orthophosphorus values than Lake Bistineau. Low Secchi disc visibility and high potential for primary productivity, as measured by algal assay control yield, were reported. Although there were no visible algal blooms, there were emergent and submerged macrophytes noted and chlorophyll a levels ranged from 3.0 µg/l to 46.6 µg/l through the seasonal sampling.

Shampine (1971) reports that attempts have been made in recent years to control the weed problem in Lake Bistineau by lowering the water level in the late spring and keeping it low until fall.

*See Appendix E.

B. Rate-Limiting Nutrient:

Algal assay results indicate that Lake Bistineau was nitrogen limited during the spring. Spikes with nitrogen or nitrogen and phosphorus simultaneously resulted in increases of assay yield. Addition of phosphorus alone did not stimulate a growth response. The mean inorganic nitrogen to orthophosphorus (N/P) ratios in the lake samples were 11/1 or less on all sampling occasions, also suggesting nitrogen limitation.

C. Nutrient Controllability:

1. Point sources -

The mean annual phosphorus loading of 1.67 g $P/m^2/yr$ to Lake Bistineau is in excess of the eutrophic level proposed by Vollenweider (1975) and four times greater than the oligotrophic level for a lake with such volume and retention time. The annual phosphorus load from the five known point sources was estimated to be 24.2% of the total load reaching Lake Bistineau. The Minden #1 plant contributed 5.9%, Minden #2 contributed 6.6%, Springhill contributed an estimated 8.2% and the remaining two plants an estimated 3.5% of the total phosphorus load.

In general, few lakes are nitrogen limited as a result of low nitrogen. Rather, excessive phosphorus levels shift limitation to nitrogen or other factors. Regardless of the primary nutrient limitation suggested by either algal assay or nutrient

ratios, the most feasible approach to nutrient control, if desirable, is through available phosphorus control technology and subsequent establishment of phosphorus limitation within the water body.

2. Nonpoint sources -

The mean annual phosphorus load from measured tributaries amounted to 68.8% of the total load to Lake Bistineau. Bayou Dorcheat contributed 54.0% of the total annual nutrient load and ungaged tributaries were estimated to have contributed 5.6%. Background loading to Boone Creek is approximately four times higher than the values encountered for unimpacted streams. This high loading is probably attributable to the fact that Boone Creek flows through the Louisiana Ordnance Plant.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake morphometry data was provided by the State of Louisiana. Tributary flow data were provided by the Louisiana District Office of the U.S. Geological Survey (USGS) (outlet drainage area includes the lake surface area). Mean hydraulic retention time was obtained by dividing the lake volume by the mean flow of the outlet. Precipitation values are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 69.67 km^2.
2. Mean depth: 2.1 meters.
3. Maximum depth: 7.6 meters.
4. Volume: 148.019 x 10^6 m^3.
5. Mean hydraulic retention time: 42 days.

B. Tributary and Outlet (see Appendix B for flow data):

1. Tributaries -

Name	Drainage area(km^2)	Mean flow (m^3/s)
B-1 Clarke Bayou	279.7	3.15
C-1 Boone Creek	51.5	0.58
D-1 Bayou Dorcheat	2,934.5	31.95
E-1 Brushy Creek	111.9	1.27
G-1 Toulon Bayou	42.7	0.49
Minor tributaries and immediate drainage -	261.8	3.76
Totals	3,682.1	41.20

2. Outlet - A-1 Loggy Bayou 3,752.9 40.81

C. Precipitation:

1. Year of sampling: 177.6 cm.
2. Mean annual: 125.5 cm.

III. LAKE WATER QUALITY SUMMARY

Lake Bistineau was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake and from one or more depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 1.8 meters at Station 01, 3.4 meters at Station 02, 3.4 meters at Station 03, and 1.5 meters at Station 04. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

LAKE HISTINEAU
STORET CODE 2203

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	(3/21/74) Sooo = 4 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(5/31/74) Sooo = 4 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	(11/11/74) Sooo = 4 N*	RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	9	18.0- 19.5	18.7	0.0- 1.5	6	26.7- 27.3	26.9	0.0- 1.5	8	16.6- 17.6	17.0	0.0- 1.5
MAX DEPTH**	4	18.0- 18.7	18.1	0.6- 3.4	4	25.9- 27.2	26.9	0.0- 3.4	4	16.7- 17.6	17.0	1.5- 1.5
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	5	7.0- 8.2	7.8	0.6- 1.5	3	4.6- 6.2	5.0	0.0- 1.5	8	6.0- 8.6	6.7	0.0- 1.5
MAX DEPTH**	4	6.4- 8.2	7.1	0.6- 3.4	4	1.8- 6.0	5.3	0.0- 3.4	4	6.4- 8.4	6.8	1.5- 1.5
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	9	98.- 130.	110.	0.0- 1.5	6	86.- 194.	105.	0.0- 1.5	8	99.- 160.	115.	0.0- 1.5
MAX DEPTH**	4	99.- 130.	119.	0.6- 3.4	4	98.- 194.	108.	0.0- 3.4	4	99.- 160.	113.	1.5- 1.5
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	8	6.1- 6.9	6.3	0.0- 1.5	6	6.8- 7.3	7.0	0.0- 1.5	8	5.3- 6.3	5.6	0.0- 1.5
MAX DEPTH**	4	6.2- 6.6	6.2	0.6- 3.4	4	6.5- 7.0	6.9	0.0- 3.4	4	5.3- 6.1	5.6	1.5- 1.5
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	8	10.- 10.	10.	0.0- 1.5	6	10.- 14.	12.	0.0- 1.5	8	10.- 10.	10.	0.0- 1.5
MAX DEPTH**	4	10.- 10.	10.	0.6- 3.4	4	10.- 15.	12.	0.0- 3.4	4	10.- 10.	10.	1.5- 1.5
TOTAL P (MG/L)												
0.-1.5 M DEPTH	8	0.047-0.103	0.061	0.0- 1.5	6	0.049-0.088	0.059	0.0- 1.5	8	0.053-0.088	0.075	0.0- 1.5
MAX DEPTH**	4	0.050-0.084	0.060	0.6- 3.4	4	0.048-0.088	0.056	0.0- 3.4	4	0.055-0.083	0.075	1.5- 1.5
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	8	0.016-0.046	0.023	0.0- 1.5	6	0.005-0.018	0.010	0.0- 1.5	8	0.009-0.024	0.019	0.0- 1.5
MAX DEPTH**	4	0.016-0.046	0.026	0.6- 3.4	4	0.005-0.018	0.006	0.0- 3.4	4	0.011-0.024	0.020	1.5- 1.5
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	8	0.030-0.100	0.070	0.0- 1.5	6	0.040-0.070	0.060	0.0- 1.5	8	0.020-0.030	0.020	0.0- 1.5
MAX DEPTH**	4	0.040-0.110	0.090	0.6- 3.4	4	0.050-0.070	0.060	0.0- 3.4	4	0.020-0.030	0.020	1.5- 1.5
AMMONIA (MG/L)												
0.-1.5 M DEPTH	8	0.030-0.070	0.040	0.0- 1.5	6	0.040-0.060	0.050	0.0- 1.5	8	0.020-0.060	0.055	0.0- 1.5
MAX DEPTH**	4	0.030-0.070	0.050	0.6- 3.4	4	0.040-0.060	0.045	0.0- 3.4	4	0.020-0.060	0.045	1.5- 1.5
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	8	0.300-0.500	0.400	0.0- 1.5	6	0.600-0.800	0.700	0.0- 1.5	8	0.500-0.800	0.700	0.0- 1.5
MAX DEPTH**	4	0.300-0.400	0.400	0.6- 3.4	4	0.500-0.800	0.600	0.0- 3.4	4	0.500-0.700	0.650	1.5- 1.5
SECCHI DISC (METERS)	5	0.8- 1.1	1.0		4	1.1- 1.4	1.2		4	0.8- 1.5	0.8	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
03/21/74	1. Melosira	865
	2. Flagellates	595
	3. Dactylococcopsis	433
	4. Synedra	325
	5. Cryptomonas	324
	Other genera	921
	Total	3,463
05/31/74	1. Flagellates	1,163
	2. Melosira	862
	3. Cryptomonas	431
	4. Dactylococcopsis	215
	5. Lyngbya	172
	Other genera	1,414
	Total	4,257
11/11/74	1. Flagellates	560
	2. Cryptomonas	252
	3. Melosira	140
	4. Centric diatom	56
	5. Trachelomonas	28
	Other genera	140
	Total	1,176

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
03/21/74	01	7.8
	02	8.0
	03	6.9
	04	5.0
05/31/74	01	12.0
	02	15.4
	03	46.6
	04	41.5
11/11/74	01	2.5
	02	4.0
	03	2.5
	04	3.0

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a.03/21/74

Spike(mg/l)	Ortho P Conc.(mg/l)	Inorganic N Conc.(mg/l)	Maximum Yield (mg/l-dry wt.)
Control	0.035	0.132	3.5
0.05 P	0.085	0.132	3.4
0.05 P + 1.0 N	0.085	1.132	20.9
1.00 N	0.035	1.132	5.2

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential for primary production was high in Lake Bistineau during spring sampling. A response in assay yield to the addition of nitrogen as well as the lack of response to the addition of phosphorus indicates nitrogen limitation. Maximum yield was achieved with the simultaneous addition of both nutrients.

It should be noted that significant chemical changes took place in Louisiana lake samples between collection and algal assay. The assay data should be considered in this context and until such differences are resolved, used with caution for any predictions of actual lake conditions. Such chemical changes are likely to alter the control yield as well as modifying the N/P ratio. The autumn algal assay results have not been included in this report as these substantial changes in nutrient levels have removed their information value.

The N/P ratios in the field samples of 11/1 or less on all sampling occasions suggest primary limitation by nitrogen (a mean N/P ratio of 14/1 or more generally reflects phosphorus limitation).

IV. NUTRIENT LOADING
(See appendix D for data)

For the determination of nutrient loadings, the Louisiana National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of February, March, and April when two samples were collected. Sampling was begun in June 1974, and was completed in May 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Louisiana District Office of the USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of the USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual of the nutrient loads (in $kg/km^2/year$) at Stations B-1, E-1, and G-1 at Clarke Bayou, Brushy Creek, and Toulon Bayou, respectively, and multiplying the means by the ZZ area in km^2.

The operator of the Minden #2 wastewater treatment plant provided monthly effluent samples and corresponding flow data. Nutrient loads for the Minden #1, Springhill, Cullen and Cotton Valley wastewater treatment plants were estimated at 1.134 kg/P and 3.401 kg N/capita/year.

A. Waste Sources:

1. Known municipal -

Name	Pop.* Served	Treatment*	Mean Flow ($m^3/d \times 10^3$)	Receiving Water*
Minden #1	6,000	Trickling Filter	2.271**	Bayou Dorcheat
Minden #2	12,000	Stabilization Pond	3.785	Cooley Branch/ Bayou Dorcheat
Springhill	8,430	Activated Sludge	3.191**	Bayou Dorcheat
Cullen	2,460	Stabilization Pond	0.931**	Bayou Dorcheat
Cotton Valley	1,100	Imhoff	0.416**	Bayou Dorcheat

2. Known industrial -

Name	Product	Treatment	Mean Flow ($m^3/d \times 10^3$)	Receiving Water*
Louisiana Ordnance Plant	Ammunition Plant	Trickling Filter	Unknown	Boone Creek

*Sewage treatment plant questionnaires and/or U.S. EPA, 1971.
**Estimated at 0.3785 m^3/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (nonpoint load) -		
B-1 Clarke Bayou	8,430	7.3
C-1 Boone Creek	5,095	4.4
D-1 Bayou Dorcheat	62,645	54.0
E-1 Brushy Creek	2,765	2.4
G-1 Toulon Bayou	815	0.7
b. Minor tributaries and immediate drainage (nonpoint load) -	6,545	5.6
c. Known municipal STP's -		
Minden #1	6,805	5.9
Minten #2	7,700	6.6
Springhill	9,560	8.2
Cullen	2,790	2.4
Cotton Valley	1,245	1.1
d. Septic tanks* -	460	0.4
e. Known industrial -		
Louisiana Ordnance Plant	unknown	
f. Direct precipitation** -	1,220	1.0
Total	116,075	100.0

2. Outputs - A-1 Loggy Bayou 63,385

3. Net annual P accumulation - 52,690

*Estimate based on 1,375 lakeside dwellings, 1 park, and 38 camps.
**Estimated (See NES Working Paper No. 175).

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (nonpoint load) -		
B-1 Clarke Bayou	75,835	7.0
C-1 Boone Creek	29,875	2.7
D-1 Bayou Dorcheat	710,025	65.1
E-1 Brushy Creek	30,750	2.8
G-1 Toulon Bayou	8,675	0.8
b. Minor tributaries and immediate drainage (nonpoint load) -	65,450	6.0
c. Known municipal STP's -		
Minden #1	20,405	1.9
Minden #2	16,505	1.5
Springhill	28,670	2.6
Cullen	8,365	0.8
Cotton Valley	3,740	0.3
d. Septic tanks* -	17,360	1.6
e. Known industrial -		
Louisiana Ordnance Plant	Unknown	
f. Direct precipitation** -	75,215	6.9
Total	1,090,870	100.0

2. Outputs - A-1 Loggy Bayou 878,300

3. Net annual N accumulation - 212,570

*Estimate based on 1,375 lakeside dwellings, 1 State Park, and 38 camps.
**Estimated (See NES Working Paper No. 175).

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
B-1 Clarke Bayou	30	271
C-1 Boone Creek*	99	580
D-1 Bayou Dorcheat	21	241
E-1 Brushy Creek	25	275
G-1 Toulon Bayou	19	203

E. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P (mg/l)	Mean Total N (mg/l)
F-1 Cooley Creek	0.039	0.666

The nutrient values for this tributary are below the levels encountered for the other unimpacted gaged tributaries draining to Lake Bistineau.

*Background levels for this tributary probably inflated by the Louisiana Ordnance Plant upstream.

F. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotrophic" loading would be considered one between "eutrophic" and "oligotrophic".

Note that Vollenweider's model may not apply to lakes with short hydraulic retention times or in which light penetration is severely restricted by high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading ($g/m^2/yr$)
Estimated loading for Lake Bistineau	1.67
Vollenweider's "eutrophic" loading	0.83
Vollenweider's "oligotrophic" loading	0.42

V. LITERATURE REVIEWED

Shampine, W.J. 1971. Chemical, Biological and Physical Data for the Major Lakes and Reservoirs in Louisiana. Louisiana Dept. of Public Works, #5. Baton Rouge, Louisiana.

U.S. Environmental Protection Agency. 1971. The 1968 Inventory of Municipal Waste Facilities. EPA Publication No. OWP-1, Volume 6. U.S. Government Printing Office, Washington, D.C.

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. National Environmental Research Center, Las Vegas, Nevada, and Pacific Northwest Environmental Research Laboratory, Corvallis, Oregon.

Vollenweider, R.A. 1975. Input-Output Models With Special Reference to the Phosphorus Loading Concept in Limnology. Schweiz. Z. Hydrol. 37:53-84.

VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR LOUISIANA 04/11/77

LAKE CODE 2203 LAKE BISTINEAU

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 3752.9

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2203A1	3752.9	72.77	83.25	82.97	78.15	91.18	16.68	10.45	3.82	4.53	4.05	13.22	31.15	40.81
220381	279.7	5.44	5.86	5.38	5.10	5.07	2.32	1.02	0.68	0.82	0.79	2.15	3.40	3.15
2203C1	51.5	0.99	1.08	0.99	0.93	0.96	0.42	0.19	0.12	0.15	0.14	0.40	0.62	0.58
220301	2934.5	56.92	65.13	64.85	61.16	71.36	13.08	8.18	3.00	3.57	3.17	10.36	24.49	31.95
2203E1	111.9	2.21	2.35	2.15	2.04	2.10	0.93	0.40	0.27	0.31	0.31	0.85	1.36	1.27
220361	42.7	0.82	0.91	0.82	0.79	0.79	0.37	0.16	0.10	0.12	0.12	0.34	0.51	0.49
2203ZZ	331.5	6.46	6.94	6.40	6.12	6.23	2.75	1.22	0.79	0.96	0.93	2.52	3.99	3.76

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 3752.9
SUM OF SUB-DRAINAGE AREAS = 3751.9

TOTAL FLOW IN = 496.74
TOTAL FLOW OUT = 492.23

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2203A1	6	74	198.218	9	121.479				
	7	74	6.881	7	4.106				
	8	74	11.468	11	7.476				
	9	74	131.956	8	205.014				
	10	74	33.697	6	78.438				
	11	74	99.958	9	137.337				
	12	74	100.242	8	109.303				
	1	75	138.469	12	161.123				
	2	75	237.578	9	416.258	22	112.135		
	3	75	140.735	9	59.749	22	214.075		
	4	75	81.836	6	135.355	20	75.889		
	5	75	206.996	4	191.139				
220381	6	74	14.725	9	9.061				
	7	74	0.510	7	0.311				
	8	74	0.850	11	0.566				
	9	74	9.854	8	15.291				
	10	74	2.492	6	5.833				
	11	74	7.476	9	10.251				
	12	74	7.532	8	8.155				
	1	75	10.760	12	16.962				
	2	75	11.525	9	10.307	22	1.557		
	3	75	9.826	9	5.154	22	10.704		
	4	75	4.899	6	2.747	20	3.002		
	5	75	18.066	4	61.731				

TRIBUTARY FLOW INFORMATION FOR LOUISIANA 04/11/77

LAKE CODE 2203 LAKE BISTINEAU

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
2203C1	6	74	2.718	9	1.671				
	7	74	0.093	7	0.057				
	8	74	0.159	11	0.102				
	9	74	1.812	8	2.832				
	10	74	0.510	6	1.076				
	11	74	1.388	9	1.897				
	12	74	1.388	8	1.501				
	1	75	1.897	12	3.002				
	2	75	2.039	9	1.841	22	0.198		
	3	75	1.756	9	0.906	22	1.897		
	4	75	0.623	6	0.481	20	0.538		
	5	75	3.200	4	10.987				
2203D1	6	74	155.743	9	95.145				
	7	74	5.380	7	3.228				
	8	74	8.976	11	5.862				
	9	74	103.640	8	160.273				
	10	74	26.193	6	61.448				
	11	74	78.721	9	107.604				
	12	74	82.119	8	85.800				
	1	75	108.454	12	126.010				
	2	75	185.759	9	325.644	22	87.782		
	3	75	110.153	9	46.723	22	167.353		
	4	75	63.996	6	105.905	20	59.465		
	5	75	161.689	4	149.513				
2203E1	6	74	5.748	9	3.540				
	7	74	0.193	7	0.119				
	8	74	0.340	11	0.210				
	9	74	3.851	8	5.947				
	10	74	0.991	6	2.350				
	11	74	3.002	9	4.106				
	12	74	3.002	8	3.256				
	1	75	4.134	12	6.541				
	2	75	4.446	9	3.964	22	1.586		
	3	75	3.794	9	1.982	22	4.134		
	4	75	1.388	6	0.283	20	1.161		
	5	75	6.966	4	41.626				
2203G1	6	74	2.435	9	1.472				
	7	74	0.085	7	0.051				
	8	74	0.142	11	0.091				
	9	74	1.614	8	2.492				
	10	74	0.368	6	0.906				
	11	74	1.133	9	1.557				
	12	74	1.161	8	1.246				
	1	75	1.586	12	2.492				
	2	75	1.699	9	1.529	22	0.255		
	3	75	1.444	23	1.076				
	4	75	0.538	6	0.396	20	0.453		
	5	75	2.662	4	15.886				

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

220301
32 14 51.0 093 25 55.0
LAKE BISTINEAU
22 LOUISIANA

11EPALES
3

2111202
000M FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/03/21	14 45	0000	18.7		42	98	6.90	10K	0.030	0.300	0.030	0.01K
	14 45	0002	18.7	7.8		98						
	14 45	0005	18.7	8.2		98	6.60	10K	0.030	0.300	0.040	0.016
74/05/31	14 35	0000	27.3		53	84	7.30	10K	0.050	0.700	0.060	0.007
	14 35	0006	27.2	6.0		102	6.95	10K	0.040	0.600	0.060	0.007
74/11/11	14 35	0000	17.5	8.6	60	100	6.31	10K	0.030	0.700	0.020K	0.009
	14 35	0005	17.6	8.4		99	6.15	10K	0.020	0.500	0.020K	0.011

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/03/21	14 45	0000	0.047	7.8	
	14 45	0005	0.050		
74/05/31	14 35	0000	0.054	12.0	
	14 35	0006	0.052		
74/11/11	14 35	0000	0.053	2.5	
	14 35	0005	0.055		

— K VALUE KNOWN TO BE LESS THAN INDICATED —

STORET RETRIEVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

220302
32 23 45.0 093 25 25.0
LAKE BISTINEAU
22 LOUISIANA

11EPALES
3

2111292
0016 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/03/21	15	0000	14.4		40	108	6.60	10	0.040	0.400	0.040	0.020
	15	0005	19.2	7.8		110	6.50	10K	0.040	0.400	0.060	0.018
	15	0011	18.1	7.2		111	6.30	10K	0.050	0.400	0.080	0.021
74/05/31	14	0000	27.3		42	95	7.20	11	0.060	0.800	0.060	0.011
	14	0005	27.0	6.2		99	7.00	11	0.040	0.600	0.040	0.005
	14	0008	27.0	6.0		98	7.00	10	0.040	0.600	0.050	0.005
74/11/11	14	0000	17.0	6.8	30	160	5.94	10K	0.060	0.700	0.030	0.019
	14	0005	17.0	7.0		160	5.76	10K	0.060	0.600	0.030	0.021

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT -EMNING PERCENT
74/03/21	15	0000	0.053	8.0	
	15	0005	0.056		
	15	0011	0.058		
74/05/31	14	0000	0.058	15.4	
	14	0005	0.049		
	14	0008	0.048		
74/11/11	14	0000	0.071	4.0	
	14	0005	0.076		

— K VALUE KNOWN TO BE LESS THAN INDICATED —

STORET RETRIEVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

220303
32 24 57.0 093 21 18.0
LAKE BISTINEAU
22 LOUISIANA

11EPALES
3

2111202
0015 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/03/21	15	25 0000	14.5		32	128	6.20	10K	0.040	0.500	0.100	0.026
	15	25 0005	18.7	7.0		130	6.10	10K	0.050	0.400	0.100	0.031
	15	25 0011	18.2	6.4		127	6.20	10K	0.050	0.400	0.110	0.031
74/05/31	14	50 0000	26.9		45	113	7.00	12	0.050	0.700	0.060	0.010
	14	50 0005	26.8	5.0		111	6.80	13	0.050	0.600	0.060	0.010
	14	50 0011	25.9	1.8		114	6.55	15	0.060	0.600	0.060	0.005
74/11/11	15	10 0000	16.6	6.4	30	118	5.51	10K	0.060	0.800	0.020	0.019
	15	10 0005	16.7	6.4		118	5.35	10K	0.040	0.700	0.020	0.019

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/03/21	15	25 0000	0.085	6.9	
	15	25 0005	0.065		
	15	25 0011	0.062		
74/05/31	14	50 0000	0.064	46.6	
	14	50 0005	0.061		
	14	50 0011	0.060		
74/11/11	15	10 0000	0.079	2.5	
	15	10 0005	0.075		

— K VALUE KNOWN TO BE LESS THAN INDICATED —

STORET RETRIEVAL DATE 75/12/11
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

220304
32 29 29.0 093 22 03.0
LAKE BISTINEAU
22 LOUISIANA

11EPALES
3

2111202
0005 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/03/21	15 40	0000	18.0			130	6.20	10K	0.070	0.500	0.080	0.045
	15 40	0002	18.0	7.0		130	6.20	10K	0.070	0.400	0.100	0.046
74/05/31	15 35	0000	26.7	4.6	54	194	6.80	14	0.050	0.400	0.070	0.018
74/11/11	15 20	0000	16.8	6.0	34	111	5.45	10K	0.060	0.800	0.030	0.021
	15 20	0005	16.9	6.6		108	5.42	10K	0.050	0.700	0.020	0.024

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/03/21	15 40	0000	0.103	5.0	
	15 40	0002	0.084		
74/05/31	15 35	0000	0.088	41.5	
74/11/11	15 20	0000	0.088	3.0	
	15 20	0005	0.083		

— K VALUE KNOWN TO BE LESS THAN INDICATED —

25

APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 77/04/11

2203A1
32 19 15.0 093 25 00.0 4
LOGGY BAYOU
22 15 WINGGOLD
07BISTINEAU 101691
LA HWY 154 XING AT DAM
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/09	10	10	0.028	0.600	0.015	0.010	0.050
74/07/07	10	15	0.152	1.100	0.020	0.010	0.070
74/08/11	09	45	0.004	0.500	0.010	0.010	0.030
74/09/08	09	35	0.040	0.700	0.020	0.005	0.035
74/10/06	09	45	0.024	0.700	0.020	0.015	0.050
74/11/09	09	45	0.024	1.200	0.080	0.020	0.040
74/12/08	09	30	0.024	0.600	0.025	0.020	0.050
75/01/12	09	20	0.008	0.500	0.040	0.016	0.050
75/02/09	09	30	0.055	0.800	0.080	0.032	0.060
75/02/22	13	15	0.016	0.500	0.032	0.016	0.050
75/03/09	10	40	0.015	0.650	0.024	0.018	0.060
75/03/22	10	45	0.018	0.400	0.024	0.018	0.050
75/04/06	09	40	0.005	0.500	0.020	0.015	0.030
75/04/20	08	45	0.100	0.550	0.025	0.035	0.080
75/05/04	09	45	0.035	0.550	0.120	0.010	0.025

STORET RETRIEVAL DATE 77/04/11

22)331
32 25 15.0 093 26 45.0 4
CLARKE BAYOU
22 15 RINGGOLD
T/RISTINEAU 101691
2NDRY RD BRDG 1 MI N LA HWY 527 JCT
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/09	10	50	0.032	2.500	0.040	0.020	0.085
74/07/07	11	15	0.042	0.500	0.035	0.035	0.090
74/08/11	09	15	0.020	0.700	0.020	0.137	0.144
74/09/08	09	05	0.056	0.700	0.035	0.035	0.085
74/10/06	10	15	0.040	0.100	0.045	0.025	0.100
74/11/09	09	30	0.024	0.900	0.070		0.090
74/12/04	10	00	0.147	0.700	0.016	0.025	0.080
75/01/12	09	00	0.016	0.950	0.048	0.024	0.095
75/02/09	09	00	0.030	0.700	0.032	0.024	
75/02/22	13	30	0.016	0.800	0.024	0.024	0.080
75/03/09	10	20	0.031	0.650	0.025	0.024	0.060
75/03/22	11	00	0.022	0.900	0.023	0.022	0.070
75/04/06	09	15	0.040	0.450	0.020	0.025	0.050
75/04/20	09	05		1.250	0.120	0.190	0.260
75/05/04	09	25	0.045	0.850	0.110	0.020	0.050

6

STORET RETRIEVAL DATE 77/04/11

/TYPA/AMENT/STREAM

2203C1
32 32 20.0 093 22 30.0 4
BOONE CREEK
22 15 MINDEN
T/BISTINEAU 101691
LA HWY 164 BRDG 2 MI E OF DOYLINE
11EPALES 04001004
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/09	14	25	0.092	1.200	0.110	0.045	0.110
74/07/07	11	10	1.200	0.800	0.055	0.040	0.750
74/08/11	10	15	0.008	0.900	0.025	0.035	0.085
74/09/08	10	15	2.760	1.100	0.110	0.540	0.550
74/10/06	10	50	3.000	0.300	0.075	0.480	0.500
74/11/09	10	50	0.552	0.800	0.090	0.315	0.360
74/12/09	09	45	0.144	0.700	0.040	0.055	0.090
75/01/12	10	10	0.160	1.100	0.072	0.048	0.080
75/02/09	10	10	0.464	0.500	0.088	0.128	0.165
75/02/22	10	40	0.704	0.600	0.096	0.320	0.390
75/03/09	11	35	0.784	0.500	0.046	0.227	0.280
75/03/22	11	20	0.495	2.400	0.089	0.313	0.393
75/04/06	10	10	1.100	0.450	0.065	0.250	0.300
75/04/20	09	35	0.065	0.400	0.060	0.035	0.070
75/05/04	10	10	0.060	1.050	0.125	0.035	0.040

STORET RETRIEVAL DATE 77/04/11

220301
32 32 15.0 093 19 50.0 4
BAYOU DORCHEAT
22 15 MINDEN
T/BISTINEAU 101091
LA HWY 164 BRDG 4.5 MI E OF DOYLINE
11EPALES 0400100
0000 FEET DEPTH CLASS 00

/T/PA/A/M/T/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/05	13 55		0.064	2.300	0.040	0.035	0.120
74/07/01	11 35		0.032	0.800	0.045	0.050	0.140
74/08/11	10 25			0.500	0.045		
74/09/09	10 05		0.044	0.700	0.160	0.030	0.060
74/10/05	10 40		0.044	0.100	0.045	0.035	0.100
74/11/04	10 35		0.015	0.650	0.055	0.037	0.100
74/12/09	09 35		0.024	0.500	0.020	0.025	0.050
75/01/12	10 00		0.016	0.600	0.032	0.036	0.070
75/02/04	10 00		0.015	0.600	0.040	0.024	0.050
75/02/22	10 30		0.024	0.530	0.072	0.024	0.070
75/03/04	11 10		0.035	0.400	0.040	0.042	0.080
75/03/22	11 15		0.006	0.550	0.024	0.018	0.060
75/04/06	10 10		0.015	0.700	0.035	0.030	0.050
75/04/20	09 30		0.080	1.150	0.065	0.020	0.100
75/05/04	10 00		0.135	0.400	0.135	0.030	0.080

STORET RETRIEVAL DATE 77/04/11

22[illegible]
32 20 50.0 093 18 00.0 4
BRUSHY CREEK
22 15 WINGOLD
T/BISTINEAU 101691
LA HWY 7 BYPS 5 MI S LA HWY 164 JCT
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/T1/P2/AMB:T/STP:34

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/09	13 35		0.070	0.700	0.050	0.020	0.055
74/07/07	10 50		0.112	0.500	0.030	0.022	0.060
74/08/11	12 00		0.040	0.400	0.020	0.015	0.030
74/09/08	09 50		0.100	1.200	0.135	0.025	0.055
74/10/06	10 35		0.069	0.200	0.220	0.015	0.160
74/11/09	10 30		0.010	0.400	0.345	0.022	0.110
74/12/04	09 30		0.010	1.100	0.015	0.015	0.030
75/01/17	09 45		0.004	0.700	0.024	0.040	0.060
75/02/09	09 45		0.040	0.500	0.024	0.016	0.050
75/02/22	10 15		0.040	0.700	0.032	0.016	0.120
75/03/09	11 00		0.022	0.500	0.015	0.015	0.040
75/03/22	11 00		0.035	0.450	0.031	0.025	0.070
75/04/06	09 50		0.060	0.600	0.050	0.025	0.070
75/04/20	09 15		0.250	0.400	0.050	0.015	0.040
75/05/04	09 50		0.045	0.800	0.050	0.020	0.050

STORET RETRIEVAL DATE 77/04/11

/TYPA/AMBNT/STREAM

2203F1
32 26 30.0 093 19 00.0 4
COOLEY CREEK
22 15 KINGGOLD
T/STINEAU 101691
2NDRY RD BRDG 3.5 MI SW LA HWY 7 JCT
11EPALES 04001004
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/04	13	25	0.112	0.700	0.040	0.030	0.070
74/07/07	10	35	0.260	0.350	0.020	0.020	0.047
74/08/11	09	50	0.240	0.500	0.037	0.040	0.040
74/09/08	09	40	0.208	0.400	0.025	0.030	0.045
74/10/06	10	10	0.176	0.300	0.135	0.015	
74/11/09	10	00	0.032	0.600	0.035	0.045	0.050
74/12/08	09	10	0.072	0.500	0.010	0.020	0.040
75/01/12	09	25	0.068	0.500	0.064	0.035	0.040
75/02/09	09	40	0.168	0.700	0.032	0.016	0.020
75/02/22	10	00	0.168	0.900	0.048	0.016	0.030
75/03/09	10	50	0.135	0.350	0.018	0.015	0.030
75/03/22	10	50	0.113	0.550	0.018	0.015	0.030
75/04/06	09	40	0.230	0.350	0.035	0.010	0.020
75/04/20	09	35	0.070	0.250	0.040	0.025	0.050
75/05/04	09	45	0.075	0.900	0.115	0.020	0.040

STORET RETRIEVAL DATE 77/04/11

220301
32 23 20.0 093 20 50.0 4
TOULON BAYOU
22 15 INGGOLD
T/BISTINEAU 101691
2NDRY RD BRDG 4.5 MI W LA HWY 7 JCT
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/06/09	13 05		0.048	0.700	0.050	0.026	0.075
74/07/07	10 20		0.086	0.200	0.037	0.035	0.065
74/08/11	09 40		0.048	0.400	0.025	0.035	0.065
74/09/08	09 30		0.040	1.300	0.030	0.040	0.055
74/10/06	09 55		0.024	0.700	0.015	0.025	0.045
74/11/09	09 45		0.004	0.700	0.035	0.030	0.070
74/12/08	09 00		0.024	0.700	0.015	0.020	0.050
75/01/12	09 25		0.024	0.700	0.040	0.016	0.060
75/02/09	09 30		0.024	0.500	0.024	0.016	0.030
75/02/22	09 45		0.016	0.300	0.040	0.016	0.040
75/03/29	10 35		0.008	1.000	0.032	0.016	0.060
75/04/06	09 15		0.020	0.200	0.025	0.020	0.020
75/04/20	08 55		0.005	0.300	0.025	0.010	0.040
75/05/04	09 30		0.045	0.950	0.060	0.015	0.050

STORET RETRIEVAL DATE 77/04/11

22030A TF22030A P006000
32 37 30.0 093 17 50.0 4
MINDEN #1 (TF)
22 15 MINDEN
T/LAKE BISTINEAU 101691
BAYOU DORCHEAT
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/08/09	11 00								
CP(T)-			0.280	26.000	9.200	7.500	9.900		
74/08/09	16 00								
74/09/09	11 00								
CP(T)-			0.600	12.500	5.200	1.900	3.450		
74/09/09	16 00								
74/10/14	09 00								
CP(T)-			0.326	24.000	11.000	6.700	9.100		
74/10/14	15 30								
74/11/06	08 45								
CP(T)-			0.240	19.000	5.900	4.300	6.800		
74/11/06	15 30								
74/12/06	08 30								
CP(T)-			0.980	12.000	5.500	2.600	4.200		
74/12/06	14 00								
75/01/06	08 30								
CP(T)-			0.480	24.000	9.000	5.500	9.050		
75/01/06	15 30								
75/02/05	09 00								
CP(T)-			0.640	11.000	3.400	2.200	4.800		
75/02/05	16 00								
75/03/05	09 00								
CP(T)-			0.800	16.000	5.200	2.700	5.400		
75/03/05	15 00								
75/04/04	08 30								
CP(T)-			0.080	16.500	0.200	1.120	5.150		
75/04/04	14 30								
75/05/07	09 00								
CP(T)-			0.350	13.500	4.200	1.600	2.500		
75/05/07	14 00								
75/06/05	09 00								
CP(T)-			0.050	22.000	8.900	4.400	5.600		
75/06/05	13 45								
75/07/01	09 00								
CP(T)-			0.025	17.500	7.800	3.800	5.900		
75/07/01	15 00								

STORET RETRIEVAL DATE 77/04/11

2203FA P02203FA P007250
32 37 00.0 093 16 15.0 4
MINDEN #2 (PD)
22 15 MINDEN
T/LAKE BISTINEAU 101691
COOLEY BRANCH TO BAYOU DORCHEAT
11EPALES 00001004
0000 FEET DEPTH CLASS 00

/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/08/07	13 30		0.080	14.000	1.450	5.500	7.350	1.000	1.000
74/09/09	13 15		0.398	15.700	0.690	5.350	6.200	1.000	1.000
74/10/14	13 30		0.040	13.000	0.225	5.600	6.700	1.000	1.000
74/11/06	08 30		0.610	9.000	0.094	5.300	6.400	1.000	1.000
74/12/06	13 00		2.240	5.300	0.810	4.700	5.600	1.000	1.000
75/01/07	09 00		0.080	11.000	2.100	4.400	5.200	1.000	1.000
75/02/05	08 30		0.080	12.000	1.800	2.900	4.800	1.000	1.000
75/03/05	09 00		0.240	11.000	1.300	3.000	4.700	1.000	1.000
75/04/04	08 45		0.080	13.800	0.150	2.400	5.200	1.000	1.000
75/05/06	13 30		0.103	13.500	0.915	3.900	4.600	1.000	1.000
75/06/05	14 30		0.100	6.900	0.210	3.700	4.900	1.000	1.000
75/07/01	09 30		0.050	14.000	1.880	3.900	5.200	1.000	1.000

APPENDIX E

PARAMETRIC RANKINGS OF LAKES
SAMPLED BY NES IN 1974

STATE OF LOUISIANA

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
2201	ANACOCO LAKE	0.031	0.080	455.833	8.700	10.400	0.007
2202	BRUIN LAKE	0.057	0.250	450.333	16.350	15.000	0.012
2203	LAKE PISTINEAU	0.061	0.100	458.000	12.933	13.200	0.018
2204	BLACK BAYOU	0.046	0.090	453.417	17.818	12.200	0.009
2205	BUNDICK LAKE	0.157	0.235	469.667	20.467	10.600	0.073
2207	COCODRIE LAKE	0.090	0.400	479.000	35.300	7.700	0.026
2208	COTILE LAKE	0.037	0.100	442.333	12.650	14.000	0.011
2209	CONCORDIA LAKE	0.076	0.080	468.333	32.950	14.800	0.009
2210	CROSS LAKE	0.057	0.080	475.250	38.385	11.400	0.010
2211	D'ARBONNE LAKE	0.038	0.100	458.250	6.800	13.200	0.011
2212	FALSE RIVER LAKE	0.082	0.130	442.500	24.550	14.900	0.023
2213	INDIAN CREEK	0.031	0.150	458.333	21.467	14.800	0.010
2214	SALINE LAKE	0.111	0.350	493.000	15.333	9.600	0.025
2215	TURKEY CREEK LAKE	0.176	0.170	477.833	21.967	14.600	0.033
2216	LAKE VERRET	0.163	0.100	481.428	62.028	12.000	0.056
2217	LAKE VERNON	0.018	0.120	436.667	4.900	14.400	0.007
2219	BLACK LAKE	0.077	0.150	454.000	12.733	11.600	0.015
2220	COCODRIE	0.106	0.050	478.333	33.433	11.800	0.014
4807	CADDO LAKE	0.049	0.070	463.562	20.125	10.000	0.008

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
2201	ANACOCO LAKE	92 (16)	43 (14)	67 (12)	89 (16)	83 (15)	94 (17)	
2202	BRUIN LAKE	61 (11)	11 (2)	83 (15)	61 (11)	0 (0)	50 (9)	
2203	LAKE BISTINEAU	50 (9)	58 (9)	61 (11)	72 (13)	42 (7)	33 (6)	
2204	BLACK BAYOU	72 (13)	72 (13)	78 (14)	56 (10)	50 (9)	81 (14)	
2205	BUNDICK LAKE	11 (2)	33 (6)	33 (6)	44 (8)	78 (14)	0 (0)	
2207	COCODRIE LAKE	28 (5)	0 (0)	11 (2)	11 (2)	100 (18)	17 (3)	
2208	COTILE LAKE	83 (15)	50 (9)	94 (17)	83 (15)	33 (6)	61 (11)	
2209	CONCORDIA LAKE	44 (8)	83 (14)	39 (7)	22 (4)	14 (2)	81 (14)	
2210	CROSS LAKE	56 (10)	83 (14)	28 (5)	6 (1)	72 (13)	69 (12)	
2211	D'ARBONNE LAKE	78 (14)	50 (9)	56 (10)	94 (17)	42 (7)	56 (10)	
2212	FALSE RIVER LAKE	33 (6)	39 (7)	89 (16)	28 (5)	6 (1)	28 (5)	
2213	INDIAN CREEK	92 (16)	28 (5)	50 (9)	39 (7)	14 (2)	69 (12)	
2214	SALINE LAKE	17 (3)	6 (1)	0 (0)	67 (12)	94 (17)	22 (4)	
2215	TURKEY CREEK LAKE	0 (0)	17 (3)	22 (4)	33 (6)	22 (4)	11 (2)	
2216	LAKE VERRET	6 (1)	50 (9)	6 (1)	0 (0)	56 (10)	6 (1)	
2217	LAKE VERNON	100 (18)	44 (8)	100 (18)	100 (18)	28 (5)	100 (18)	
2219	BLACK LAKE	39 (7)	22 (4)	72 (13)	78 (14)	67 (12)	39 (7)	
2220	COCODRIE	22 (4)	100 (18)	17 (3)	17 (3)	61 (11)	44 (8)	
4807	CADDO LAKE	67 (12)	94 (17)	44 (8)	50 (9)	89 (16)	89 (16)	